

REMARKS / DISCUSSION OF ISSUES

Claims 1-22 are pending in the present application.

35 U.S.C. §103 Rejections

A. The final Office Action rejects claims 1, 7, and 12-13 under 35 U.S.C. §103(a) over U.S. Patent No. 6,477,054 to Hagerup (the *Hagerup* patent). Applicants respectfully traverse this rejection. As explained below, claims 1, 7, and 12-13 are patentable over the cited reference.

Claim 1 is allowable because the *Hagerup* patent fails to disclose a device for thermal management of an LED including a trace layer overlying and adjacent to said substrate; and a pad overlying and adjacent to said trace layer, said pad being operable to mount said LED.

The final Office Action asserts that the *Hagerup* patent discloses a substrate (14) overlying the heat sink; a trace layer (26) overlying and adjacent the substrate; and a pad (22) overlying and adjacent to the trace layer. The final Office Action fails to note first dielectric layer 12 interposed between pad (22) [*Hagerup*, second conductive element] and trace layer (26) [*Hagerup*, second conductive pattern], which prevents the pad (22) from being adjacent to the trace layer (26) as claimed. See Figure 4; column 3, lines 22-45; column 4, lines 1-11.

Claim 12 is allowable because the *Hagerup* patent fails to disclose a device for thermal management of an LED including a flexible substrate in thermal communication with said trace layer and said heatsink.

The final Office Action asserts that the *Hagerup* patent discloses 'a flexible substrate' because the substrate is capable of being flexed as defined by *Merriam Webster's Dictionary*, and that the fact that the substrate is flexible but becomes rigid is not convincing because the substrate is materially a flexible tape and capable of being flexed. The Applicants respectfully disagree. *Merriam Webster's Dictionary* further defines flexible as pliant, which is a synonym of pliable, i.e., supple enough to bend

freely or repeatedly without breaking. *Merriam Webster's Dictionary* further defines flex as to bend especially repeatedly. Thus, flexible has the sense of pliability and suppleness. This is further supported in the U.S. Patent No. 7,155,812 to Peterson, *et al.*, previously cited, which explains at column 1, lines 28-41, that LTCC materials are flexible and formable in the `green` unfired state, and become rigid upon firing. Flexible describes a physical characteristic of the substrate. The *Hagerup* patent discloses a low temperature co-fired ceramic substrate structure formed of individual layers of dielectric LTCC material. See Abstract; column 3, lines 11-21. At most, the *Hagerup* patent discloses a rigid co-fired ceramic structure, not a flexible substrate as claimed.

Claims 7 and claim 13 depend directly from independent claims 1 and 12, respectively, and so include all the elements and limitations of their respective independent claims. Applicants therefore respectfully submit that dependent claims 7 and 13 are allowable over the *Hagerup* patent for at least the same reasons as set forth above for their respective independent claims.

Applicants respectfully request withdrawal of the rejection of claims 1, 7, and 12-13.

B. The final Office Action rejects claim 6 under 35 U.S.C. §103(a) over the *Hagerup* patent in light of U.S. Patent No. 5, 604,673 to Washburn, *et al.* (the *Washburn* patent). Applicants respectfully traverse this rejection. As explained below, claim 6 is patentable over the cited references taken individually or in combination.

Claim 6 is allowable because neither the *Hagerup* patent nor the *Washburn* patent discloses a device for thermal management of an LED including a trace layer overlying and adjacent to said substrate; and a pad overlying and adjacent to said trace layer, said pad being operable to mount said LED as recited in independent claim 1 and discussed in Section A above. Claim 6 depends directly from independent claim 1 and so includes all the elements and limitations of independent claim 1. Claim 6 is allowable

over the *Hagerup* patent and the *Washburn* patent for at least the same reasons as independent claim 1.

Applicants respectfully request withdrawal of the rejection of claim 6.

C. The final Office Action rejects claims 2-5 under 35 U.S.C. §103(a) over the *Hagerup* patent in light of U.S. Patent No. 7,095,053 to Mazzochette, *et al.* (the *Mazzochette* patent).

Applicants respectfully traverse this rejection and assert that the rejection is improper. In the Amendment and Response to Office Action dated December 10, 2007, filed April 8, 2008, Applicants submitted an affidavit of inventor Xuejun Fan and supporting material that established invention of the subject matter of the rejected claims prior to the effective date of the Mazzochette patent.

Applicants respectfully request withdrawal of the rejection of claims 2-5.

D. The final Office Action rejects claims 8-11, 14-17, 21, and 22 under 35 U.S.C. §103(a) over the *Hagerup* patent in light of U.S. Patent No. 7,054,159 to Nakamura (the *Nakamura* patent). Applicants respectfully traverse this rejection. As explained below, claims 8-11 and 14-22 are patentable over the cited references taken individually or in combination.

Claims 8-11, 21, and 22 are allowable because neither the *Hagerup* patent nor the *Nakamura* patent discloses a device for thermal management of an LED including a trace layer overlying and adjacent to said substrate; and a pad overlying and adjacent to said trace layer, said pad being operable to mount said LED as recited in independent claim 1 and discussed in Section A above. Claims 8-11, 21, and 22 depend directly or indirectly from independent claim 1 and so include all the elements and limitations of independent claim 1. Claims 8-11, 21, and 22 are allowable over the *Hagerup* patent and the *Nakamura* patent for at least the same reasons as independent claim 1.

Claims 21 and 22 are further allowable because neither the *Hagerup* patent nor the *Nakamura* patent discloses a device for thermal management of an LED including

a via including a sidewall defining a channel through said substrate, a thermal conductive material filling at least a portion of said channel as recited in claim 21, or said thermal conductive material being solder as recited in claim 22. The final Office Action asserts that the *Nakamura* patent discloses a thermal conductive material filling and/or solder at least a portion of the channel [*sic*] because first and second heat radiating patterns 3a/3b are soldered to the circuit board 2. Applicants respectfully assert that heat radiating plate 11 is soldered onto the first radiating pattern 3a and the first heat radiating pattern 3a can be formed simultaneously with the wiring pattern as a part thereof. See Figure 2; column 4, line 57 through column 5, line 6. The *Nakamura* patent fails to disclose solder or any other thermal conductive material interior to the copper foil 5a.

Claims 14-17 are allowable because neither the *Hagerup* patent nor the *Nakamura* patent discloses a device for thermal management of an LED including a flexible substrate in thermal communication with said trace layer and said heatsink as recited in independent claim 12 and discussed in Section A above. Claims 14-17 depend directly or indirectly from independent claim 12 and so include all the elements and limitations of independent claim 12. Claims 14-17 are allowable over the *Hagerup* patent and the *Nakamura* patent for at least the same reasons as independent claim 12.

Applicants respectfully request withdrawal of the rejection of claims 8-11, 14-17, 21, and 22.

E. The final Office Action rejects claims 18-20 under 35 U.S.C. §103(a) over the *Mazzochette* patent in light of the *Nakamura* patent.

Applicants respectfully traverse this rejection and assert that the rejection is improper. In the Amendment and Response to Office Action dated December 10, 2007, filed April 8, 2008, Applicants submitted an affidavit of inventor Xuejun Fan and supporting material that established invention of the subject matter of the rejected claims prior to the effective date of the *Mazzochette* patent.

Applicants respectfully request withdrawal of the rejection of claims 18-20.

In view of the foregoing, Applicants respectfully request that the Examiner withdraw the rejections of record, allow all the pending claims, and find the application to be in condition for allowance. If any points remain in issue that may best be resolved through a personal or telephonic interview, the Examiner is respectfully requested to contact the managing attorney, Eric M. Bram, Registration No. 37,285, at 1-914-333-9635.

Respectfully submitted,

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